



COPIES OF PAPERS  
ORIGINALLY FILED

1

**SEQUENCE LISTING**

~~110~~ > NELSON, DAVID R.

<120> A LIVE, AVIRULENT STRAIN OF *V. ANGUILLARUM* THAT PROTECTS FISH AGAINST INFECTION BY VIRULENT *V. ANGUILLARUM*

<130> 5112

<140> 09/915,706  
<141> 2001-07-26

<160> 4

<170> PatentIn Ver. 2.1

<210> 1  
<211> 3588  
<212> DNA  
<213> Vibr

```
<220>
<221> modified_base
<222> (3572)
<223> a, t, c, g, other or unknown
```

gccaactgaa	atctatgttt	acgaccacgg	tggtgcaccc	aatttagatcg	ttgtcagcg	ttgttcgca	1860
agatggaaaa	cgc当地	tgtgtcaccc	aatttagatcg	ttgtcagcg	ttggtgagca	1920	
ctaagtgtca	ttctctaggg	agtcaagta	ccaacttggg	tttgc当地	tcactgttta	1980	
cccggttga	aaacgtttt	gttcatctaa	gtggaaat	gttagcaccg	aaagcggagg	2040	
ccaagacagt	agagcaagag	gttgc当地	gttcagtttc	cgaagggggag	ctgccaagcc	2100	
atatggatac	aaaacatata	gagc当地	cgatggc	agagcaggct	cagaccgtaa	2160	
gccaacactt	acacgcaggg	aacctctctg	aactgggtaa	tttaaacaat	atgaaaccggag	2220	
acttagctt	ccatttgggg	agagaagtct	ctgattttt	tcgccc当地	gaaccgcata	2280	
gccccatttc	attttggta	aaaaaagcga	ttcgatgggg	atatttaccc	ttacctgag	2340	
tgctgc当地	aatgtatgtcg	gaacaaaacg	gtgacgctt	tagtacgatt	tttaatgccc	2400	
ccggattgaa	tcatctcgat	cagggttgc	tgccggagggt	gagtaactcca	acgggtggca	2460	
ttgaaagccc	ccaaacaccc	caagc当地	tttccgttcc	ggatccgca	agtgttgaag	2520	
agcatgttac	tcagacttcc	cctgtagata	cccaatctaa	gcaagatcaa	aaaccacaat	2580	
catccgtac	gtc当地	agttggtaat	tgtgtttaaa	aaataaggaa	aaatcatggc	2640	
aagtatttac	atgc当地	gccc当地	agttgagggc	gcagc当地	tcggtcagct	2700	
agaaaacggct	gaaggtaaaa	atgacggtt	ttttgcaatc	aactcttact	tttggggtgg	2760	
cgctcgttaac	gttgc当地	acatcgtaa	cggcaccaat	gccc当地	gcatgggtgg	2820	
cgtaagcgaa	gttagcgtaa	ctaaagaagt	cgatgggtct	tctgaagacc	tactgttta	2880	
tttattcaac	ccaggttaaa	acggtaaaac	ttttgagggtt	gcattacta	agcatttcaa	2940	
cgatggtcaa	ggtc当地	tttacttcca	agttaaagcta	aaaaaagcac	gtttagttc	3000	
ttacaacgtg	agc当地	acggatctca	accgtacgg	agc当地	tttcttacac	3060	
ttctatttct	cagaagcatac	actatgagaa	agaagggtgt	gaactacaaa	gcgggtgggt	3120	
tgtgacttac	gacctaccga	ccggggaaaat	gacttctgtt	aagtaattct	ttcatttagac	3180	
atgccacgtt	aattggcatg	tctatttcat	gaatatctca	ttttaggaca	ccgttatggc	3240	
attgaactca	caacataaggc	gc当地	gaaccgtgtc	agcatcacct	atgacgttga	3300	
aacgaatggc	gccgttaaaga	cgaaagagct	ggc当地	ttggc当地	ttggc当地	3360	
ttcaggacac	aaaccagaat	cagaaaaagt	tgat当地	gagc当地	tcacgggtat	3420	
cgataaagac	aacttcgata	cagtgtatggg	gcaattcac	ccgcttctt	cgtacaaggt	3480	
tgataacaag	cttgctaatg	atgatagcca	gtttaagtg	aacttgagcc	tccgttgc当地	3540	
qaaagatttc	cacccagagaa	acttagtga	ttaaaattgag	ccgcttaa		3588	

<210> 2  
<211> 463  
<212> PRT  
<213> *Vibrio anquillarum*

<400> 2  
Met Pro Leu Ser Lys His Gln Ile Glu Gln Leu Ser Lys Pro Leu Ser  
1 5 10 15

Asp Asp Ser Ile Cys Gly Val Tyr Leu Lys Leu Glu Lys Ser Ala Phe  
20 25 30

Arg Pro Leu Arg Asn Glu Phe Asn Val Ala Gln Thr Ala Leu Arg Lys  
35 40 45

Leu Ser Gln Asn Pro Ser Ala Asp Glu Arg Asp Ala Leu Gln Glu Ala  
50 55 60

Cys Leu Asn Lys Trp Lys Ile Leu Ser Asp Ser Leu Tyr Glu Gln Phe  
65 70 75 80

Ser Lys Thr Thr Arg Asp Ile Glu Leu Ile Ser Trp Phe Val Ala Ala  
85 90 95

Gln Phe Leu Leu Asp Thr Thr Leu Glu Ser Ala Ala Asn Ser Leu Glu  
 100 105 110

Trp Leu Ala Asp Leu Ser Glu Lys His Trp Asp His Leu Asn Pro Val  
115 120 125

Leu Pro Val Glu Thr Leu Lys Ser Asp Asp Asp Lys Gly Lys Glu Arg  
130 135 140

Glu Gln Ala Asp Ala Lys Val Lys Ala Phe Phe Gln Leu Val Gly Asp  
145 150 155 160

Ser Glu Glu Ser Ser Ile Leu Tyr Ala Pro Val Leu Gln Leu Pro Leu  
165 170 175

Val Gly Glu Val Thr Phe Phe Asp Phe Gln Ser Ala Glu Arg Lys Gly  
180 185 190

Glu Ile Ser Gln Leu Lys Ser Met Leu Thr Thr Thr Val Ala Gln Glu  
195 200 205

Arg Phe Ala Ile Gln Phe Lys Met Glu Asn Ala Lys Arg Cys Val Thr  
210 215 220

Gln Leu Asp Arg Leu Ser Ala Leu Val Ser Thr Lys Cys His Ser Leu  
225 230 235 240

Gly Ser Gln Ser Thr Asn Phe Gly Phe Ala Lys Ser Leu Leu Thr Arg  
245 250 255

Val Glu Asn Ala Leu Val His Leu Ser Gly Ile Lys Leu Ala Pro Lys  
260 265 270

Ala Glu Ala Lys Thr Val Glu Gln Glu Val Ala Glu Ser Ser Val Ser  
275 280 285

Glu Gly Glu Leu Pro Ser His Met Asp Thr Lys His Ile Glu Arg Ile  
290 295 300

Pro Met Ala Ser Glu Gln Ala Gln Thr Val Ser Gln His Leu His Ala  
305 310 315 320

Gly Asn Leu Ser Glu Leu Gly Asn Leu Asn Asn Met Asn Arg Asp Leu  
325 330 335

Ala Phe His Leu Leu Arg Glu Val Ser Asp Tyr Phe Arg Gln Ser Glu  
340 345 350

Pro His Ser Pro Ile Ser Phe Leu Leu Glu Lys Ala Ile Arg Trp Gly  
355 360 365

Tyr Leu Ser Leu Pro Glu Leu Leu Arg Glu Met Met Ser Glu Gln Asn  
370 375 380

Gly Asp Ala Leu Ser Thr Ile Phe Asn Ala Ala Gly Leu Asn His Leu  
385 390 395 400

Asp Gln Val Leu Leu Pro Glu Val Ser Thr Pro Thr Val Gly Ile Glu  
405 410 415

Ser Pro Gln Thr Pro Gln Ala Lys Pro Ser Val Ser Asp Pro Arg Ser  
 420 425 430

Val Glu Glu His Val Ser Gln Thr Ser Pro Val Asp Thr Gln Ser Lys  
 435 440 445

Gln Asp Gln Lys Pro Gln Ser Ser Ala Thr Ser Ala Leu Ser Trp  
 450 455 460

<210> 3  
 <211> 176  
 <212> PRT  
 <213> Vibrio anguillarum

<400> 3  
 Met Ala Ser Ile Tyr Met Arg Val Ser Gly Leu Gln Val Glu Gly Ala  
 1 5 10 15

Ala Thr Ile Gly Gln Leu Glu Thr Ala Glu Gly Lys Asn Asp Gly Trp  
 20 25 30

Phe Ala Ile Asn Ser Tyr Ser Trp Gly Gly Ala Arg Asn Val Ala Met  
 35 40 45

Asp Ile Gly Asn Gly Thr Asn Ala Asp Ser Gly Met Val Gly Val Ser  
 50 55 60

Glu Val Ser Val Thr Lys Glu Val Asp Gly Ala Ser Glu Asp Leu Leu  
 65 70 75 80

Ser Tyr Leu Phe Asn Pro Gly Lys Asp Gly Lys Thr Val Glu Val Ala  
 85 90 95

Phe Thr Lys Pro Ser Asn Asp Gly Gln Gly Ala Asp Val Tyr Phe Gln  
 100 105 110

Val Lys Leu Glu Lys Ala Arg Leu Val Ser Tyr Asn Val Ser Gly Thr  
 115 120 125

Asp Gly Ser Gln Pro Tyr Glu Ser Leu Ser Leu Ser Tyr Thr Ser Ile  
 130 135 140

Ser Gln Lys His His Tyr Glu Lys Glu Gly Gly Glu Leu Gln Ser Gly  
 145 150 155 160

Gly Val Val Thr Tyr Asp Leu Pro Thr Gly Lys Met Thr Ser Gly Lys  
 165 170 175

<210> 4  
 <211> 117  
 <212> PRT  
 <213> Vibrio anguillarum

<220>  
 <221> MOD\_RES  
 <222> (113)  
 <223> Variable amino acid

<400> 4

Met Ala Leu Asn Ser Gln His Lys Arg Val Ser Lys Asn Arg Val Ser  
1 5 10 15

Ile Thr Tyr Asp Val Glu Thr Asn Gly Ala Val Lys Thr Lys Glu Leu  
20 25 30

Pro Phe Val Val Gly Val Ile Gly Asp Phe Ser Gly His Lys Pro Glu  
35 40 45

Ser Glu Lys Val Asp Leu Glu Glu Arg Glu Phe Thr Gly Ile Asp Lys  
50 55 60

Asp Asn Phe Asp Thr Val Met Gly Gln Ile His Pro Arg Leu Ser Tyr  
65 70 75 80

Lys Val Asp Asn Lys Leu Ala Asn Asp Asp Ser Gln Phe Glu Val Asn  
85 90 95

Leu Ser Leu Arg Ser Met Lys Asp Phe His Pro Glu Asn Leu Val Asp  
100 105 110

Xaa Ile Glu Pro Leu  
115